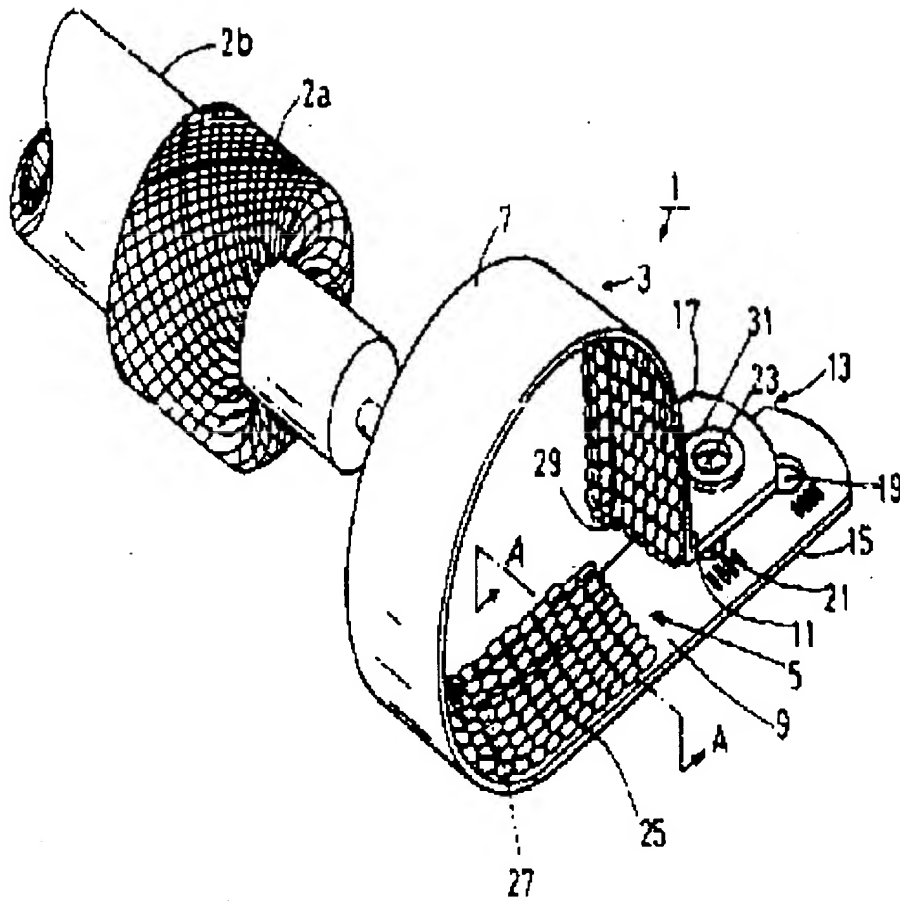


AN: PAT 1990-356953
TI: Electrical grounding clamp for mounting of cable to plate
has insulated body and conductive insert containing elastic
members to facilitate contact
PN: **GB2232020-A**
PD: 28.11.1990
AB: The grounding clamp has a mount for attaching the grounding
clamp to the mounting surface. A clamp formed of an electrical
insulating material attached to the mount for clamping the
supported member. An elastic electrically conductive member is
located between the clamp and the supported member for
contacting the supported member. The conductive member is
electrically connected to a reference potential by a conductive
path and the elasticity of the conductive member forces the
conductive member and the supported member together.; For
shielding electrical devices from electromagnetic radiation.
PA: (KITA-) KITAGAWA IND CO LTD; (KITA-) KITAGAWA INDS CO LT;
IN: KITAGAWA H;
FA: **GB2232020-A** 28.11.1990; **GB2232020-B** 06.04.1994;
JP02284366-A 21.11.1990;
CO: GB; JP;
IC: H01R-004/64; H02G-003/26;
MC: V04-A05; V04-T01;
DC: V04;
FN: 1990356953.gif
PR: JP0105489 25.04.1989;
FP: 21.11.1990
UP: 06.04.1994



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(51) INT CL⁴

H01R 4/64

(52) UK CL (Edition K)

H2E EDG EEGH EPSR

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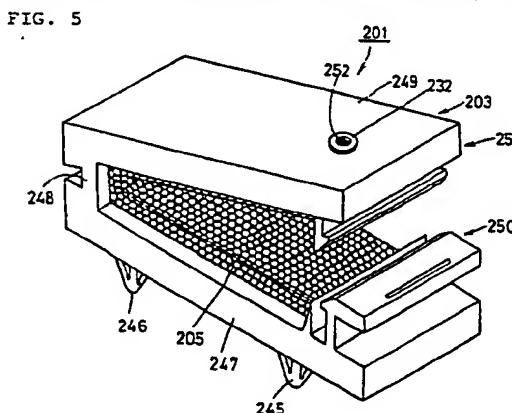
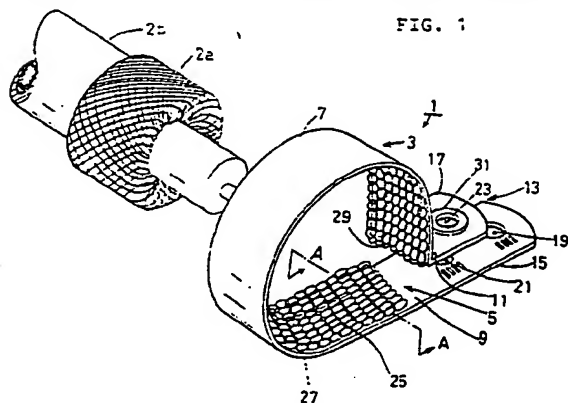
(58) Field of search

UK CL (Edition K) H2E EDG EDM EEGH EEH EEKA
EEKB EEKE EPSR EPX

INT CL⁴ H01R

(54) Electrical ground clamp

(57) A ground clamp comprises an insulating clamp body (3, 203) and a conductive flexible insert (5, 205), a conductive path being provided between a member round which the clamp locates (eg cable 2b, fig. 1) and a member on which the clamp is mounted. The flexible insert either contains elastic members or is biased by elastic members to facilitate contact by the flexible member. The flexible member may comprise metal mesh and may contain insulation piercing prongs.



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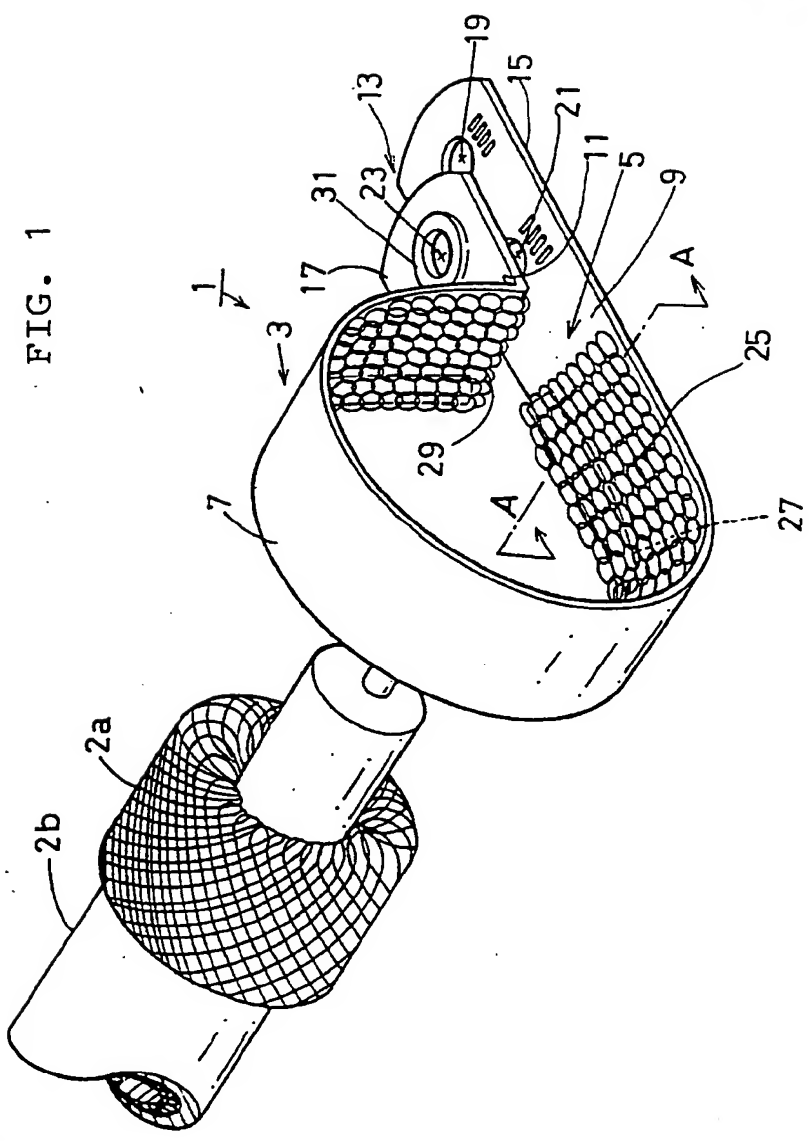


FIG. 2

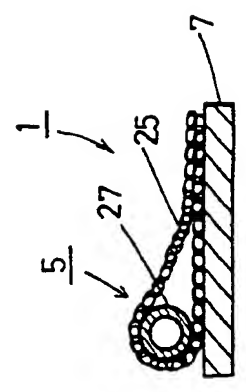


FIG. 3

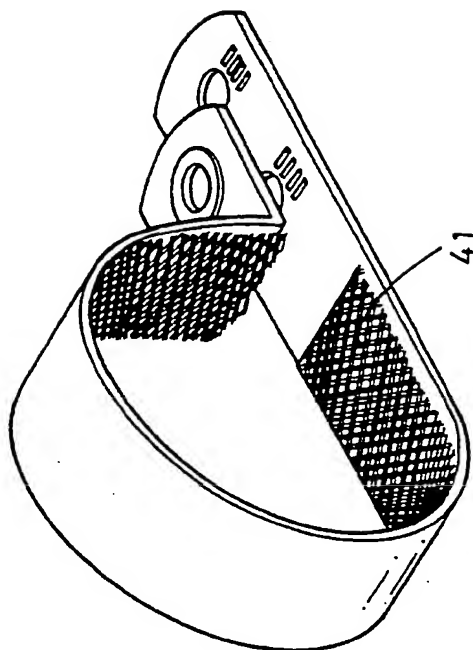


FIG. 4

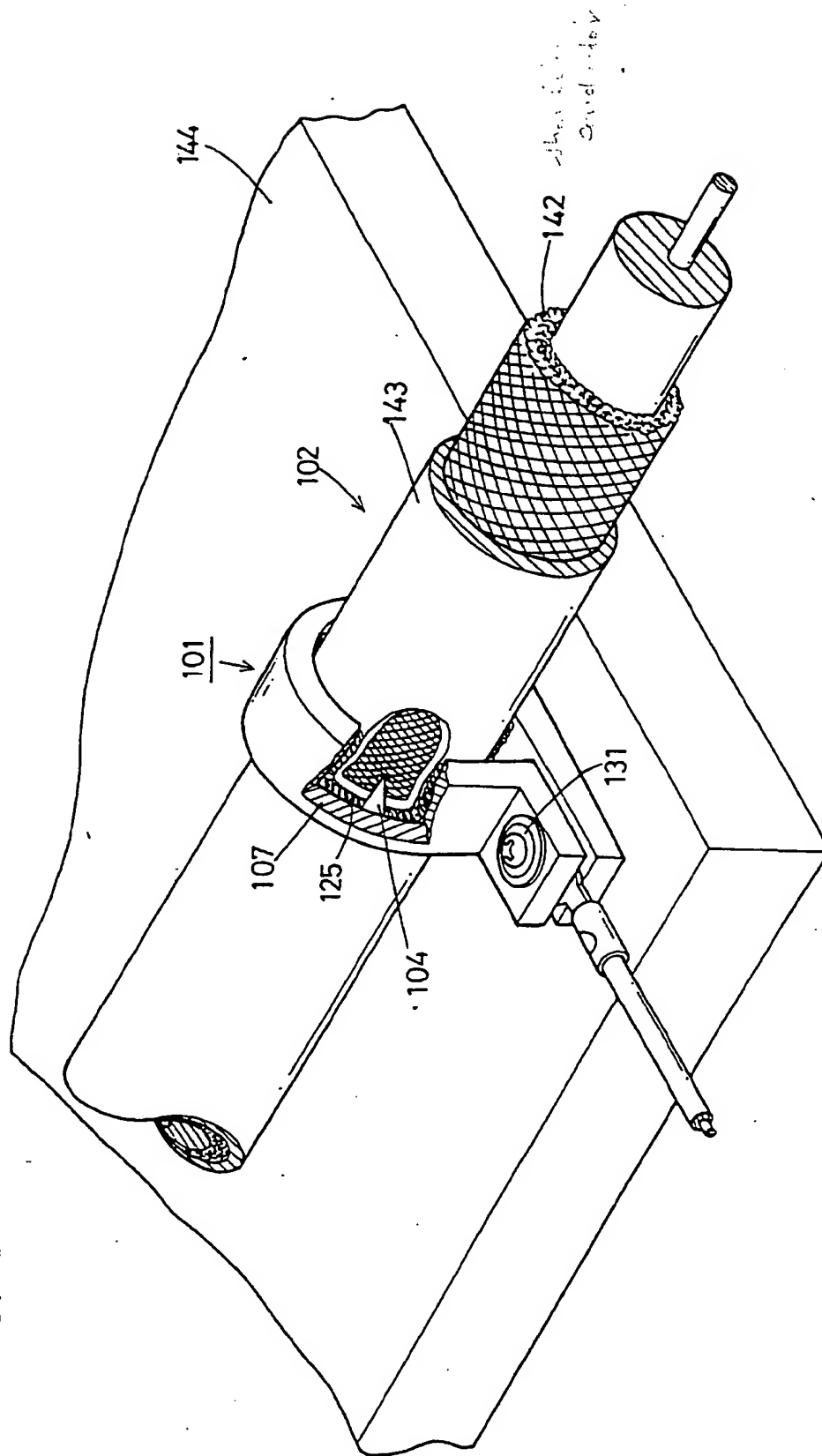
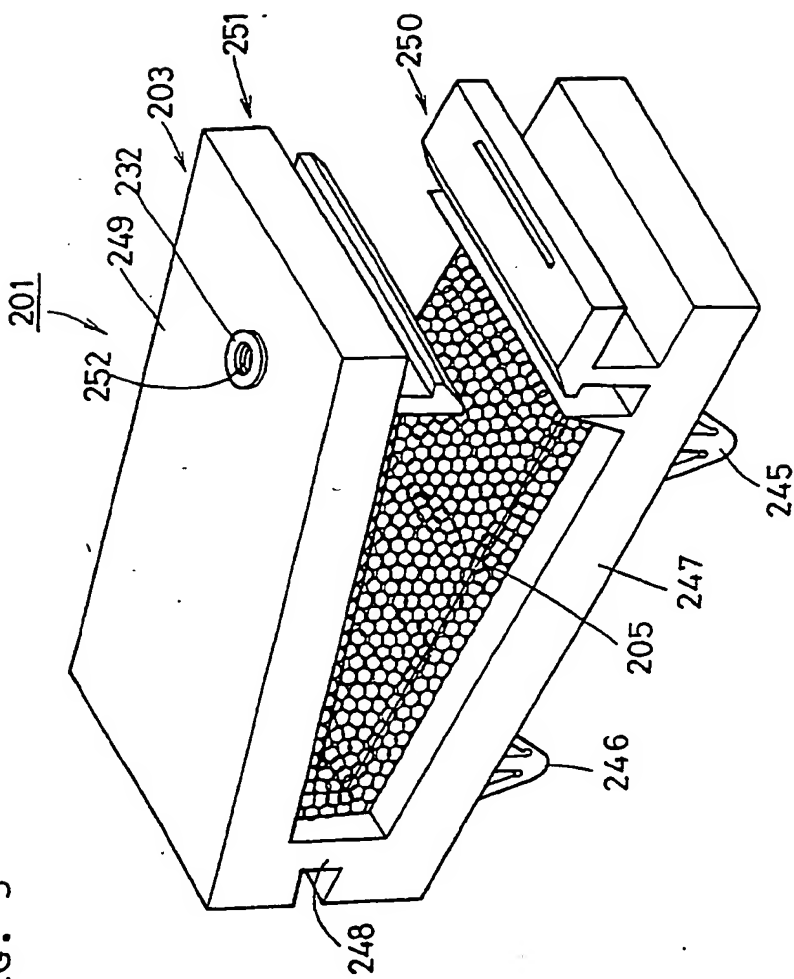


FIG. 5



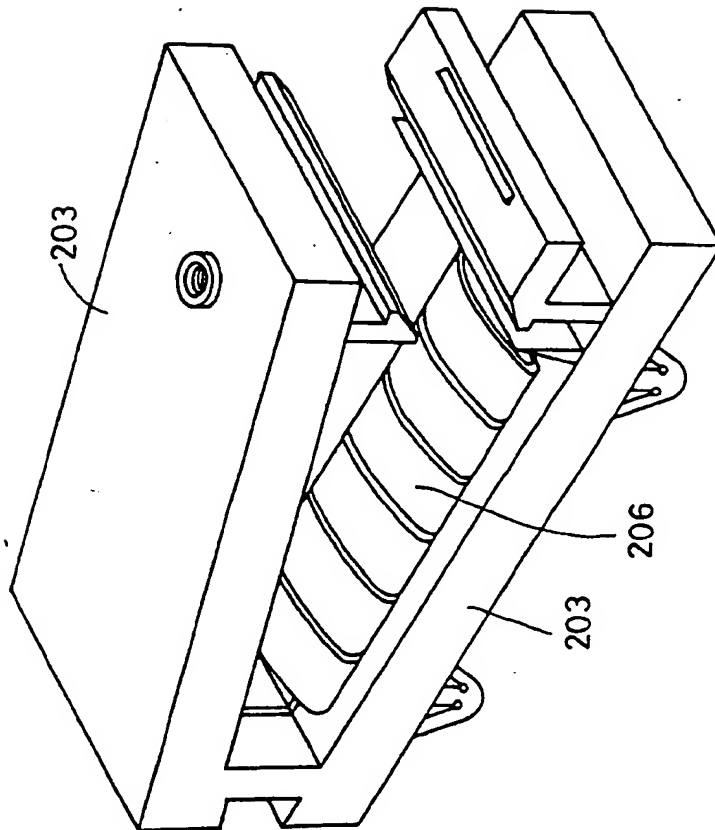


FIG. 6

FIG. 7

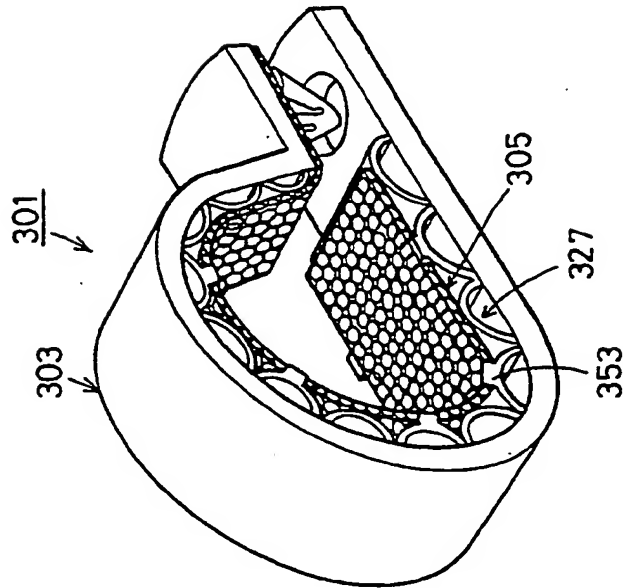


FIG. 8

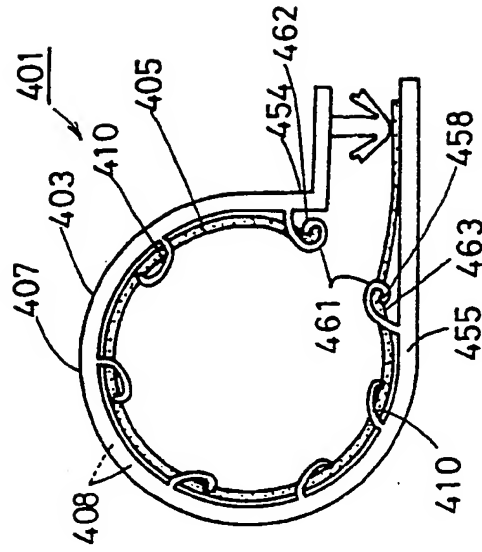


FIG. 9

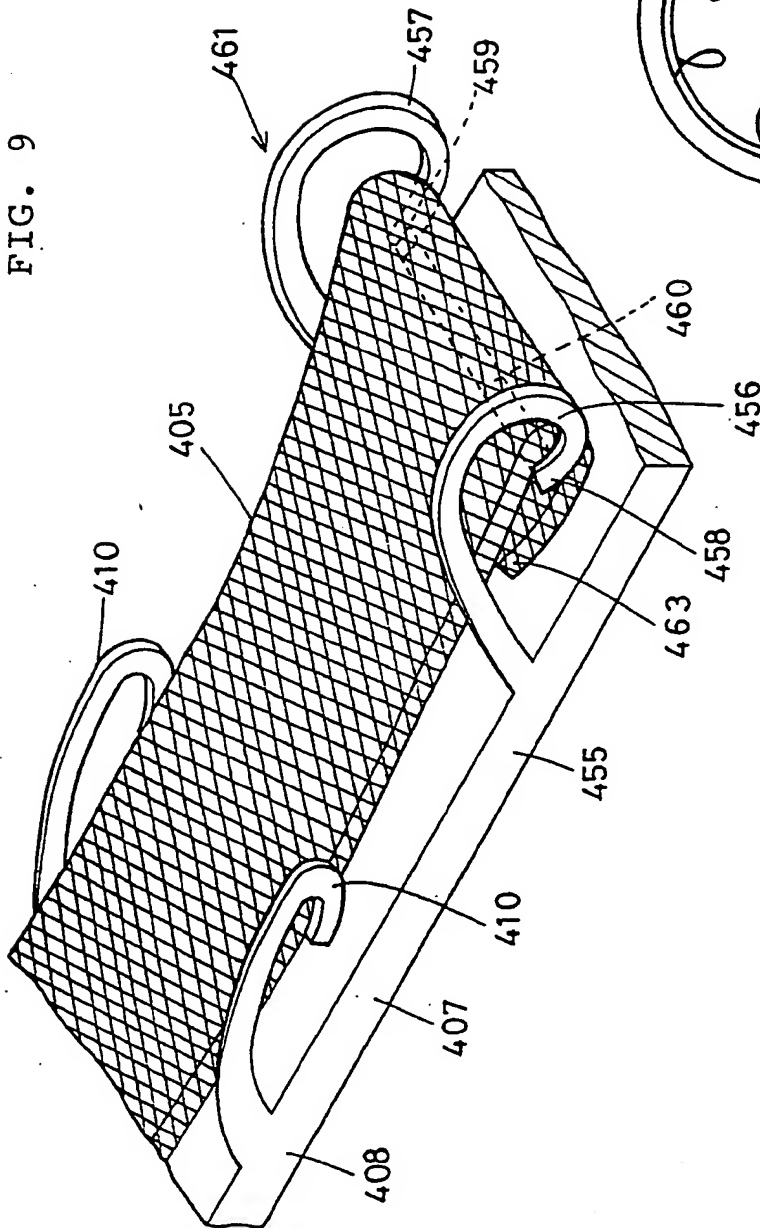


FIG. 10

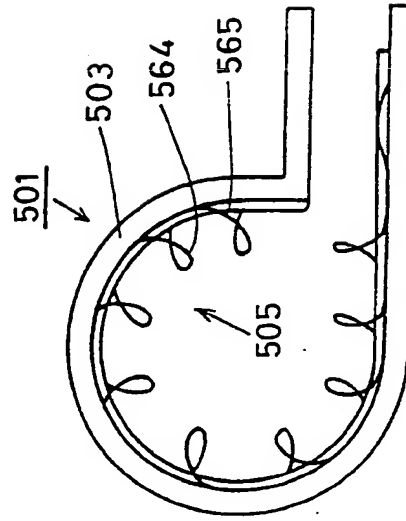
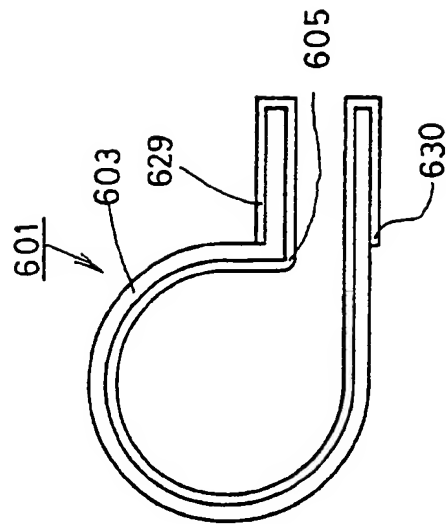


FIG. 11



GROUND CLAMP FOR AN ELECTRIC CABLE

This invention relates to a grounding clamp for mounting a member such as an electric wire, a cable, a cord, or a pipe, to a mounting plate.

Electrical devices need to be shielded from electromagnetic radiation because electromagnetic radiation generated within such devices may interfere with neighbouring devices, or the electronic devices may malfunction owing to interfering electromagnetic radiation generated from outside.

In order to shield against such electromagnetic radiation, shielding devices, for example, casings for accommodating the electronic devices and conductors for transmitting signals from the electronic device, must be electrically connected so as to be at the same electrical potential. Therefore, the shielding units are usually connected to a reference ground line.

In the prior art, however, each of the shielding devices must be provided with a ground terminal, and the terminals need to be connected with each other by means of electric wires or cables. Therefore, large numbers of ground terminals and electric wires or cables for connecting the ground terminals are required.

According to the present invention there is provided a grounding clamp for mounting and grounding a member on a mounting surface, comprising:
mounting means for attaching the grounding clamp to the mounting surface;
clamping means formed of an electrical insulating material attached to the mounting means for clamping the supported member; and
an elastic electrically conductive member located in use of the clamp between the clamping means and the supported member for contacting the supported member, whereby the conductive member is electrically connected

to a reference potential by a conductive path and the elasticity of the conductive member forces the conductive member and the supported member together.

When the supported member is secured by the clamp member having an insulating layer, the supported member is pressed onto the conductive member, and the clamp member or the conductive member is elastically deformed in the radial direction of the clamp member. Therefore, the supported member, when bestowed with conductivity, continues to be electrically connected to the conductive member. Further, when the outer-conductor connecting member of the conductive member is connected to an outer conductor having conductivity or a case or the like, the outer conductor or the like are electrically connected. Furthermore, the insulating layer of the clamp member prevents short-circuit between the conductive portion of the supported member and the outer conductor or between the conductive member and the outer conductor.

Some embodiments of the invention will now be described, by way of examples, with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a grounding clamp embodying the present invention and comprising a first embodiment;

Figure 2 is a cross-sectional view of the grounding clamp shown in Figure 1 taken along the line A-A indicated in Figure 1;

Figure 3 is a perspective view of a modification of the grounding clamp shown in Figure 1;

Figure 4 is a perspective view of a grounding clamp embodying the present invention and constituting a second embodiment;

Figure 5 is a perspective view of a grounding clamp embodying the present invention and constituting a third embodiment;

Figure 6 is a perspective view of a modification

of the grounding clamp shown in Figure 5;

Figure 7 is a perspective view of a grounding clamp embodying the present invention and constituting a fourth embodiment;

5 Figure 8 is a front view of a grounding clamp embodying the present invention and constituting a fifth embodiment;

Figure 9 is a perspective view of a part of the grounding clamp shown in Figure 8;

10 Figure 10 is a front view of a grounding clamp embodying the present invention and constituting a sixth embodiment; and

Figure 11 is a front view of a modification of the grounding clamp shown in Figure 10.

15 Figure 1 is a perspective view of a grounding clamp 1 constituting the first embodiment and Figure 2 is a cross-sectional view of the grounding clamp 1.

A clamping member 3 of the grounding clamp 1 is placed around a cable 2_b having thereon a shielding layer 2_a made of braided copper wires. This kind of
20 cable is used as an insulated wire of an electronic device, a cable for control or instrumentation, and the like. The clamp 1 surrounding the cable 2_b is secured to a mounting plate (not shown) and the shielding layer
25 2_a of the cable 2_b is grounded through a conductive member 5 forming part of the grounding clamp 1.

The elongate-shaped clamp member 3 of the grounding clamp 1 is made of an electrically insulating plastics material and comprises, as shown in Figure 1, a
30 loop part 7 for surrounding the cable 2_b, and has a mounting member 13 provided at both ends 9 and 11 of the loop part 7 for reducing the circumference of the loop part 7 to fit the size of the cable 2_b and for fixing the grounding clamp 1 to the mounting plate. One part
35 of the mounting member 13 adjacent to the end 9 is an abutting portion 15 for abutting against the mounting

plate, and the other part of the mounting member 13 adjacent to and extending perpendicularly from the end 11 is a fixing portion 17 for reducing the circumference of the loop part 7 in cooperation with the abutting portion 15.

Two holes 19 and 21 are formed in the abutting portion 15, and a hole 23 is formed in the fixing portion 17. The clamp member 3 is affixed to the mounting plate by a screw or bolt inserted through either hole 19 or hole 21 in the abutting portion 15 and through the hole 23 in the fixing portion 17. The hole 23 is aligned with one of the holes 19 or 21 in accordance with the outside diameter of the cable 2b such that the surrounding part 7 may appropriately clamp the cable 2b.

The conductive member 5 is adhered to the inner surface of the surrounding part 7 of the clamping member 3 and is maintained in contact with the cable 2b when the grounding clamp 1 is placed around the cable 2b. The conductive member 5 is composed of a doubled conductive belt 25 and an elastic member 27, as shown in Figures 1 and 2. The conductive belt 25 is made of fine braided metallic conductive wires. The elastic member 27 is placed in the rolled edge of the conductive belt 5 and provides the conductive member 5 with elasticity. The elastic member 27 is in the shape of a tube as shown in Figure 2 and is made of soft vinyl chloride, or the like, an elastic cord, and an elastic sheet such as moulded polyurethane foam, may be utilised as the elastic member 27.

An end 29 of the conductive member 5 overlays the under side of the fixing part 17 of the clamping member 3 and surrounds the hole 23 provided in the fixing member 17. An outer-conductor connecting member 31 is provided around the periphery of the hole 23. At the outer-conductor connecting member 31, the end 29 of the

conductive member 5 and the hole 23 are caulked with a metallic tube.

As described above, the grounding clamp 1 constituting the first embodiment is fixed to the mounting plate by means of the mounting member 13 in the state that the surrounding loop part 7 of the clamping member 3 surrounds the cable 2b. The shielding layer 2a of the cable 2b is thus electrically connected to the outer-conductor connecting member 31 and further to the mounting plate of a metallic case for an electronic device, when the mounting member 13 is fixed to the mounting plate via a metallic screw or bolt. Thus the shielding layer 2a and the case have the same electric potential. Alternatively, when an outer conductor including a cable is connected to the outer-conductor connecting member 31, the shielding layer 2a is grounded.

Since the conductive belt 25 is always pressed onto the cable 2b by the elastic member 27, the shielding layer 2a and the outer-conductor connecting member 31 remain securely electrically connected.

Moreover, the insulating outer surface of the clamping member 3 prevents short circuit between the clamping member 3 and outer conductors.

In brief, the grounding clamp 1 of the first embodiment holds the cable 2b easily and tightly, and the cable 2b is grounded securely without tedious installation operation.

Any material having electrical conductivity and elasticity may be used for the conductive member 5. For example, an expanded metal 41 as shown in Figure 3, a mesh tape, a conductive elastomer, or a suitably shaped metallic plate may function as the conductive member 5. Although the above-mentioned grounding clamp 1 supports the cable 2b, it may support also a metallic pipe or a flexible conduit.

A second embodiment will now be described with reference to Figure 4.

5 A grounding clamp 101 constituting the second embodiment is provided with pointed metallic projections 104 as well as components identical to those of the grounding clamp 1 of the first embodiment. As shown in Figure 4, the pointed projections 104 are positioned in an elastic conductive belt 125 adhered to the inner surface of a surrounding part 107, and extend toward the
10 centre of a cable 102.

When the cable 102 is mounted on a mounting plate 144 by the grounding clamp 101, the pointed projections 104 penetrate an insulating sheath 143 and contact a shielding conductor 142. Thus, the shielding conductor
15 142 and an outer-conductor connecting member 131 are electrically connected without removing part of the insulating sheath 143.

Consequently, the cable 102 is grounded without difficulty and bestowed with considerable endurance
20 against damage.

A grounding clamp 201 constituting the third embodiment, shown in Figure 5, is intended to be applied to a flat cable (not shown).

A clamp member 203 of the grounding clamp 201
25 comprises a base member 247 with mounting anchors 245 and 246 for fixing the grounding clamp 201 to a substrate or a case, an upper member 249, and a flexible hinge 248 interconnecting the base member 247 and the upper member 249, a locking member 250 formed at one end
30 of the base member 247, an engaging member 251 formed at one end of the upper member 249, and a conductive member 205 adhered to the inner surfaces of the base member 247 and the upper member 249. The locking member 250 and the engaging member 251, which are disposed opposite to
35 the hinge 248, engage with each other.

The conductive member 205 is electrically

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connected to a metal connecting fitting 232 which extends between the inside and the outside of the upper member 249. A screw-threaded connecting hole 252 is formed in the metal connecting fitting 232 such that an
5 outer conductor can be screwed into the connecting hole 252.

When a flat cable is secured by the clamp member 203 due to the elasticity of the conductive member 205, the outer conductor is securely connected to the
10 connecting metal fitting 232. Since the clamp 201 is installed to a mounting plate by means of the fixing anchors 245 and 246, the flat cable and the grounding clamp 201 are kept in predetermined position.

Instead of the conductive member 205 shown in
15 Figure 5, a conductive member 206 illustrated in Figure 6 may be provided on the inner surface of the clamping member 203. The conductive member 206 is made of a plurality of pawl-shaped metallic pieces which can be elastically deformed.

20 The fourth embodiment will now be described with reference to Figure 7. A grounding clamp 301 of the fourth embodiment comprises a clamping member 303 intended to surround a cable (not shown), an elastic member 327 provided on the inner surface of the clamping
25 member 303, and a conductive member 305 superimposed on the elastic member 327.

The clamping member 303 is identical to the clamping member 3 of the first embodiment. The conductive member 305 may be endowed with both
30 elasticity and conductivity like the conductive member 5 of the first embodiment, or may be endowed with only conductivity. In order to connect the conductive member 305 and the outer conductor, the outer conductor is interposed between the conductive member 305 and the
35 cable secured by the clamping member 303.

The elastic material 327 is composed of a

plurality of thin plates integrally moulded in wave-shapes together with the clamping member 303. The wave-shaped thin plates, when deformed by the cable, tend to regain their original shapes. A plurality of
5 protrusions 353 extending towards the inside are formed at both side edges of the elastic member 327.

The grounding clamp 301 described above secures the cable by means of the clamp member 303 and is fixed to a mounting plate. The conductive member 305
10 surrounding the cable is pressed onto the conductive portions of the cable by the elastic member 327.

Since the protrusions 353 formed at both side edges of the elastic member 327 abut the side edges of the conductive member 305, the protrusions 353 prevent
15 the conductive member 305 from slipping towards the outside of the elastic member 327 beyond the protrusions 353. The conductive member 327 is thus pressed and electrically connected to the cable. In addition, when
20 a layer of adhesive is attached to the both surfaces of the conductive member 305, the cable, the conductive member 305 and the clamp member 303 are kept at appropriate positions.

The heights of the wave-shaped plates of the elastic member 327 may be gradually increased and
25 decreased. If the clamping member 303 is bestowed with elasticity, the elastic member 327 may be omitted.

The fifth embodiment will now be described with reference to Figures 8 and 9.

A grounding clamp 401 comprises a clamping member
30 403 and a conductive member 405 placed on the inner surface of the clamping member 403. A plurality of thin elongate bent guide members 410, shown in greater detail in Figure 9, are provided on both side edges 408 of the clamping member 403. A holding unit 461 provided on
35 both ends 454 and 455 of a surrounding part 407 of the clamping member 403 includes thin elongate bent pulling

members 456 and 457 and linking members 460 for linking a tip 458 of the pulling member 456 and a tip 459 of the pulling member 457. Ends 462 and 463 of the conductive member 405 are held by the holding unit 461.

5 The conductive member 405 is securely held on the clamping member 403 by the guide members 410 and is pulled at its ends 462 and 463 by the holding unit 461. Further, the guide members 410 and the holding unit 461 are pressed and bent by a cable (not shown) when the
10 grounding clamp 401 is placed around the cable and installed to a mounting plate (not shown). Under such condition, the guide members 410 prevent the conductive member 405 from becoming detached from the clamping member 403 and also are bent according to the size of
15 the cable, and the holding unit 461 pulls the conductive member 405, thus fixing the conductive member 405 to the cable. Consequently, cables of various sizes can be secured by the grounding clamp 401.

 Shown in Figure 10 is the sixth embodiment. In a
20 grounding clamp 501 of the sixth embodiment, a conductive member 505 is provided on the inner surface of a clamping member 503, and comprises a metallic coiled spring 564 and a string member 565 passing through the coiled spring 564. The string member 565 is
25 adhered to the clamping member 503 at several points. The grounding clamp 501 is superior in that it is composed of a small number of components.

 Having described specific embodiments of the present invention, it is to be understood that
30 modification and variation of the invention is possible in light of the above teaching. For example, in a grounding clamp 601 shown in Figure 11, both or one of ends 629 and 630 of a conductive member 605 provided on the inner surface of a clamp member 603 may cover an end
35 or ends of the clamping member 601.

CLAIMS

1. A grounding clamp for mounting and grounding a member on a mounting surface, comprising:
- 5 mounting means for attaching the grounding clamp to the mounting surface;
- clamping means formed of an electrical insulating material attached to the mounting means for clamping the supported member; and
- 10 an elastic electrically conductive member located in use of the clamp between the clamping means and the supported member for contacting the supported member, whereby the conductive member is electrically connected to a reference potential by a conductive path and the
- 15 elasticity of the conductive member forces the conductive member and the supported member together.
2. A grounding clamp as claimed in claim 1, in which elasticity is provided to the conductive member by
- 20 passing an elastic cord through a meshed non-elastic conductive material.
3. A grounding clamp for mounting and grounding a member on a mounting surface, comprising:
- 25 mounting means for attaching the grounding clamp to the mounting surface;
- clamping means formed of an electrical insulating material attached to the mounting means for clamping the supported member;
- 30 a flexible electrically conductive member located in use of the clamp between the clamping means and the supported member, the conductive member being electrically connected to a reference potential by a conductive path; and
- 35 an elastic member mounted inside the clamping means for

forcing the conductive member and the supported member together.

4. A grounding clamp as claimed in claim 3, in which
5 the elastic member comprises a tubular piece of elastic material that in use forces the conductive member and the supported member together.

5. A grounding clamp as claimed in claim 3, in which
10 the elastic member comprises a sheet of elastic material that in use forces the conductive member and the supported member together.

6. A grounding clamp as claimed in claim 1 or claim
15 2, in which the mounting means comprises:
an abutting member for abutting the mounting surface,
the abutting member having one or more holes formed thereon, and
attaching means for extending through one of the holes
20 on the abutting member and attaching the abutting member to the mounting surface; and
the clamping means comprises:
a looped piece of electrical insulating material, a
first end of which is attached to the abutting member,
25 and
a fixing member attached to the second end of the looped piece, the fixing member having a hole formed thereon;
wherein
the attaching means extends through a hole in the
30 abutting member and a hole in the fixing member to fix the clamping means around the supported member.

7. A grounding clamp as claimed in any one of claims
3 to 5, in which the mounting means comprises:
35 an abutting member for abutting the mounting surface,
the abutting member having one or more holes formed

thereon, and

attaching means for extending through one of the holes on the abutting member and attaching the abutting member to the mounting surface; and

5 the clamping means comprises:

a looped piece of electrical insulating material, a first end of which is attached to the abutting member, and

10 a fixing member attached to the second end of the looped piece, the fixing member having a hole formed thereon; wherein

the attaching means extends through a hole in the abutting member and a hole in the fixing member to fix the clamping means around the supported member.

15

8. A grounding clamp as claimed in claim 1 or claim 2 for a supported member in the form of a coaxial cable having an insulating sheath and a shielding conductor; in which

20 the conductive member further comprises pointed projections for piercing the insulating sheath of the coaxial cable and contacting the shielding conductor.

9. A grounding clamp as claimed in any one of claims 25 3 to 5 for a supported member in the form of a coaxial cable having an insulating sheath and a shielding conductor; in which

30 the conductive member further comprises pointed projections for piercing the insulating sheath of the coaxial cable and contacting the shielding conductor.

10. A grounding clamp as claimed in claim 6, in which an outer-conducting member is provided around the hole on the fixing member, wherein the outer-conducting member contacts the attaching means and is electrically
35 connected to the conductive member such that the

conductive path is through the outer-connecting member and the attaching means.

11. A grounding clamp as claimed in claim 7, in which
5 an outer-conducting member is provided around the hole on the fixing member, wherein the outer-conducting member contacts the attaching means and is electrically connected to the conductive member such that the
10 conductive path is through the outer-connecting member and the attaching means.

12. A grounding clamp as claimed in claim 1, for a supported member in the form of a flat cable, in which the clamp means comprises:
15 first and second case members attached at first ends by a flexible hinge,
a locking member attached to a second end of the first case member, and
an engaging member attached to a second end of the
20 second case member; and
the grounding clamp further comprises a metal fitting on the clamp means that is connected to the conductive member; wherein
the conductive path to the reference potential is via
25 the metal fitting.

13. A grounding clamp as claimed in any one of claims 3 to 5, for a supported member in the form of a flat cable, in which the clamp means comprises:
30 first and second case members attached at first ends by a flexible hinge,
a locking member attached to a second end of the first case member, and
an engaging member attached to a second end of the
35 second case member; and
the grounding clamp further comprises a metal fitting on

the clamp means that is connected to the conductive member; wherein the conductive path to the reference potential is via the metal fitting.

5

14. A grounding clamp as claimed in claim 12, in which the conductive member comprises a plurality of pawl-shaped metallic pieces that elastically deform and are mounted on at least one of the first and second case members.

10

15. A grounding clamp as claimed in claim 7, in which the elastic member comprises a plurality of elastic, wave-shaped protrusions integrally formed on the inside of the looped piece of insulating material.

15

16. A grounding clamp as claimed in claim 15, in which retaining protrusions are formed on at least one of the wave-shaped protrusions for retaining the conductive member inside the clamping means.

20

17. A grounding clamp as claimed in claim 7, in which the elastic member comprises:
a plurality of guide members formed around the edge of the looped piece of insulating material; and
a pair of holding units on the looped piece of insulating material that hold the conductive member, where one holding unit secures the conductive member and the other holding unit raises the conductive member to force the conductive member and the supported member together.

25

30

18. A grounding clamp as claimed in claim 1, in which the conductive member comprises a coiled spring adhered to the clamping means and a string member passing through the coiled spring.

35

19. . A grounding clamp for mounting and grounding a member on a mounting surface, substantially as hereinbefore described with reference to and as illustrated in any one of the accompanying drawings.